Relative Speed Lab - 5

Any last minute questions?

This is worth a lot of points, we have worked on this for 3 days! --- HAND IT IN----

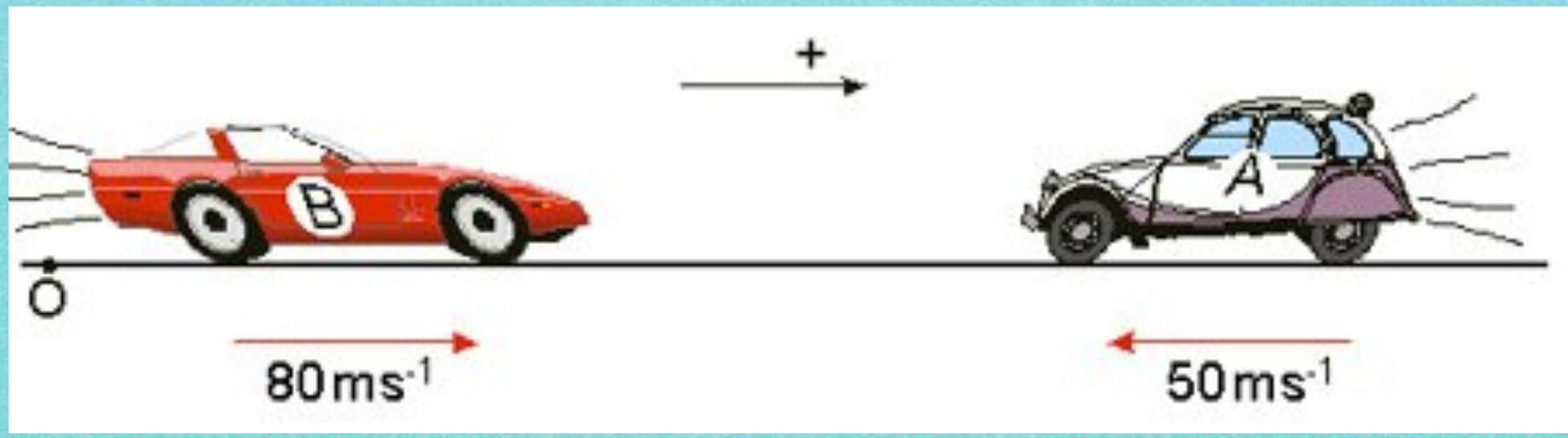
RELATIVE SPEED Practice ?'s

- A person kayaking down the Scioto river has a velocity of 12 m/s. A dog swimming the same direction has a velocity of 9 m/s. What is their relative speed to one another?

- 3 m/s

Try another one!

- What is the speed of car A relative to car B?
  130 m/s



- Note that the speeds 80m/s and 50 m/s are the speeds of the cars relative to the ground or a stationary bystander

Any questions??

- There will be relative speed questions on the "quest" coming up before the quarter ends…
- The good news… 62% of you already sort of got the idea of relative speed last week:
- You are riding in a bus, moving slowly through heavy traffic at 2.0 m/s east. You hurry to a seat at the back of the bus at 3.0 m/s west. What is your velocity relative to an observer on the sidewalk?
- a. 1.0 m/s west b. 5.0 m/s west c. 1.0 m/s east d. 5.0 m/s east

19	68 62%	16 15%	20 18%	4 4%

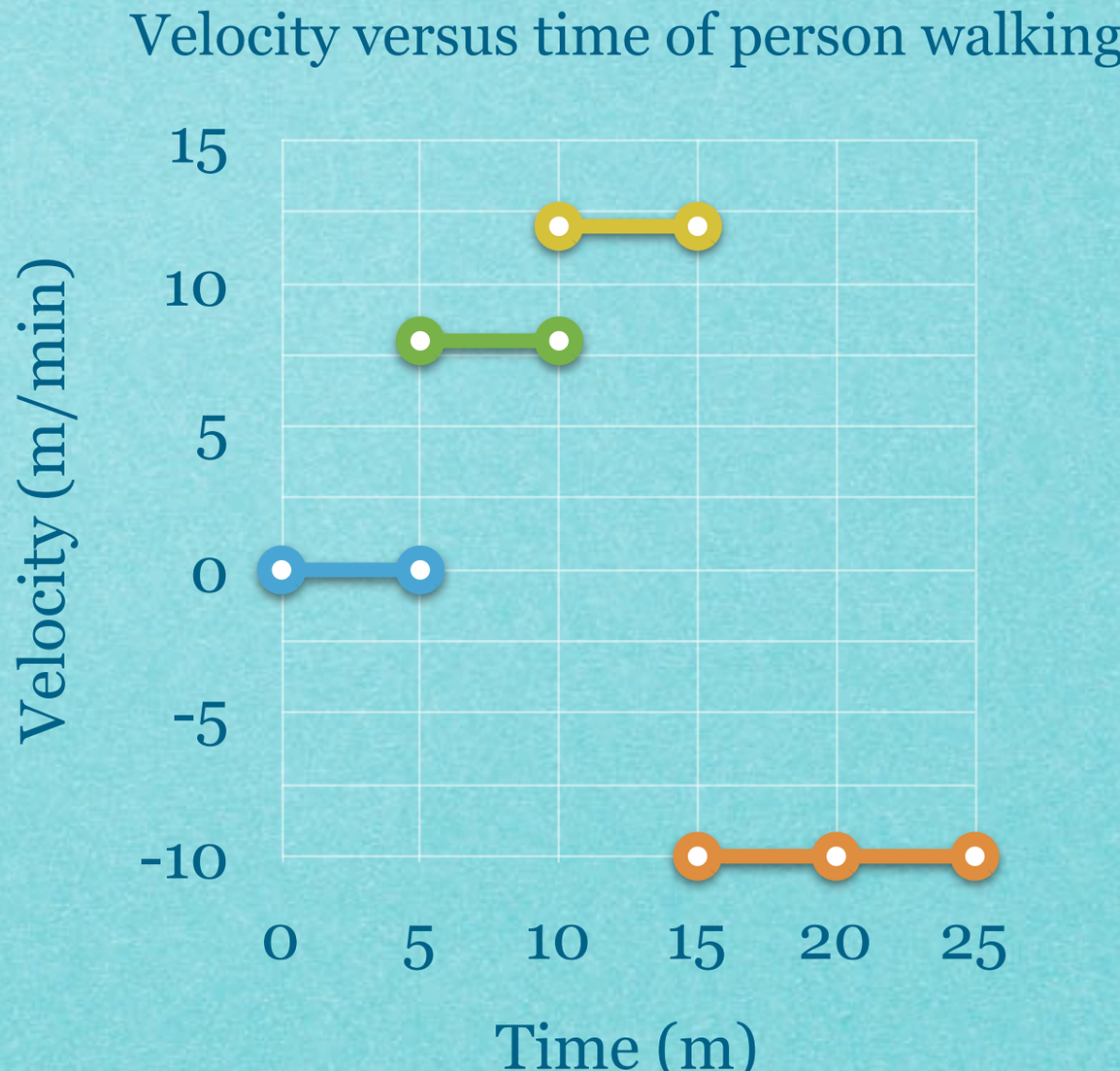
- What about speed of the person walking relative to the bus? 5m/s

Graphing review

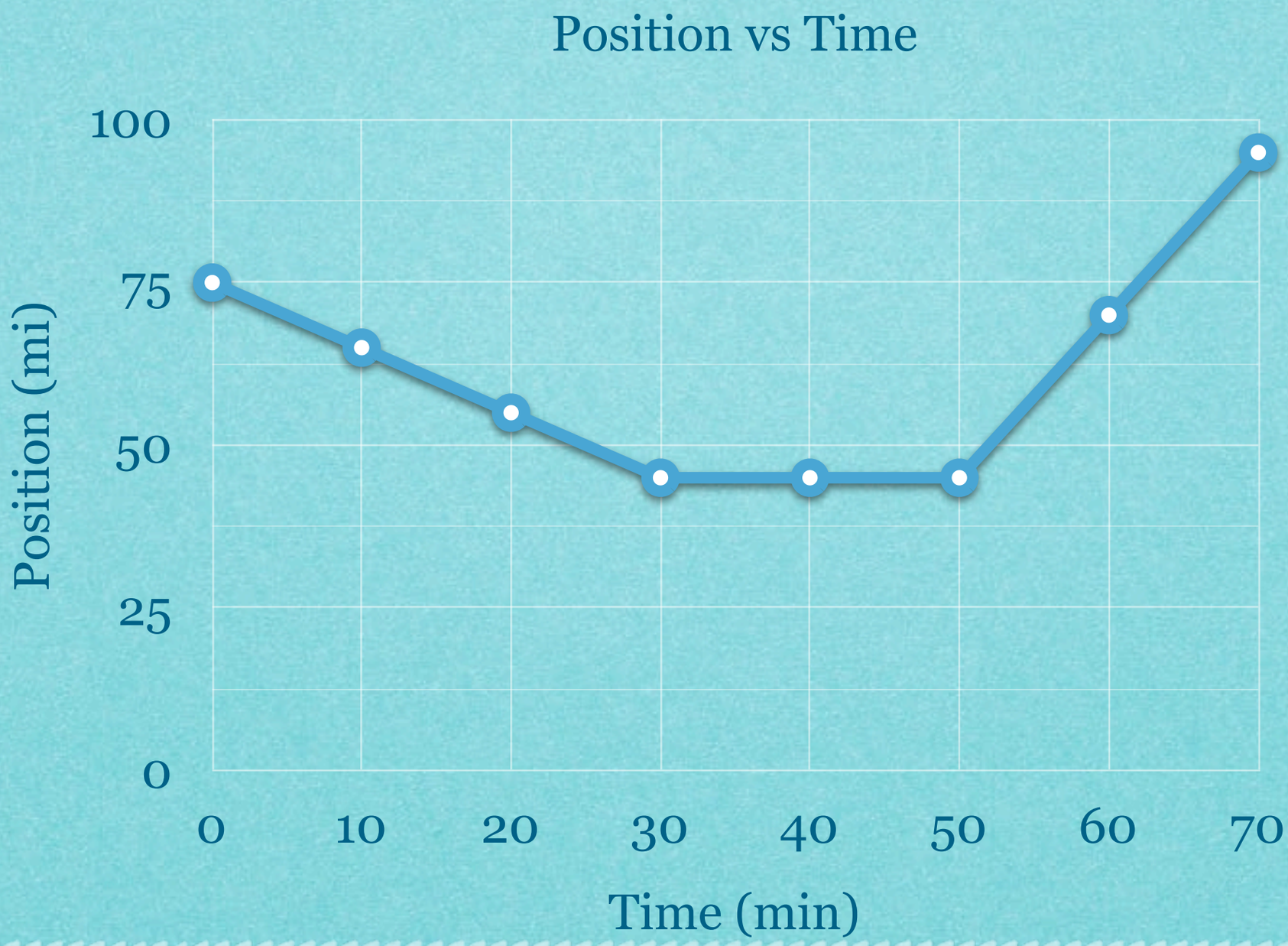
- If this is a position versus time graph, what does the slope represent?
- VELOCITY
- Could we then take the slope and graph the data on a velocity versus time graph?
- YES
- A steeper slope means… Faster velocity
- A negative slope means….. A negative velocity

Introducing VELOCITY VERSUS TIME GRAPHS!

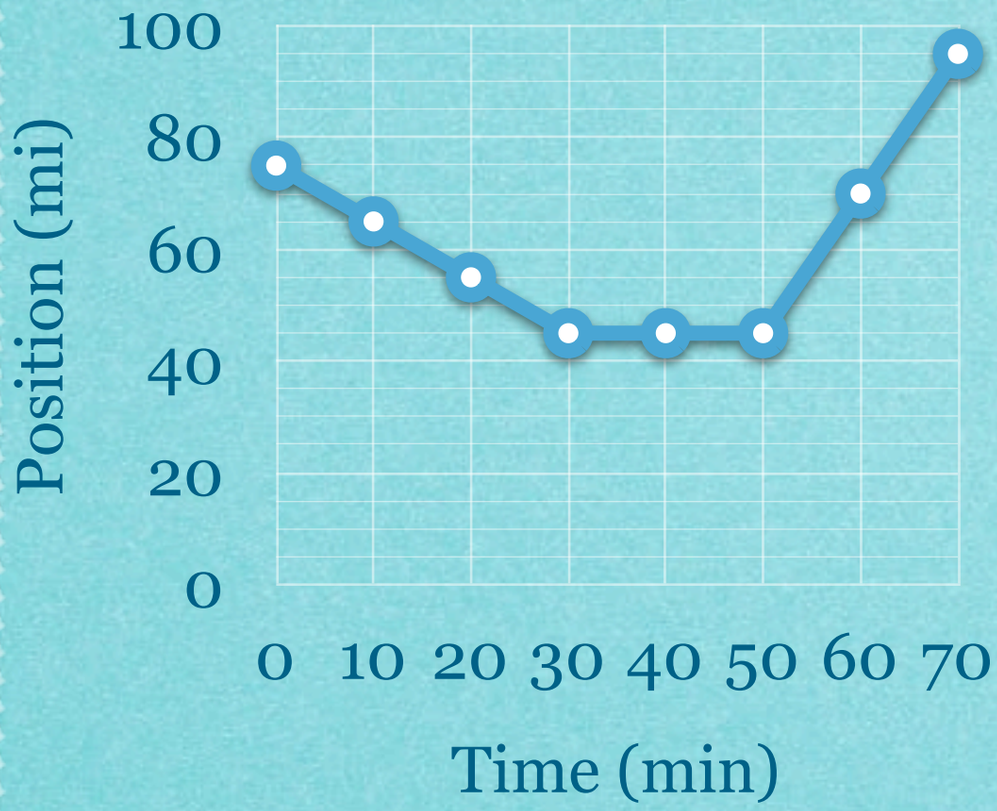
- Of course we could!

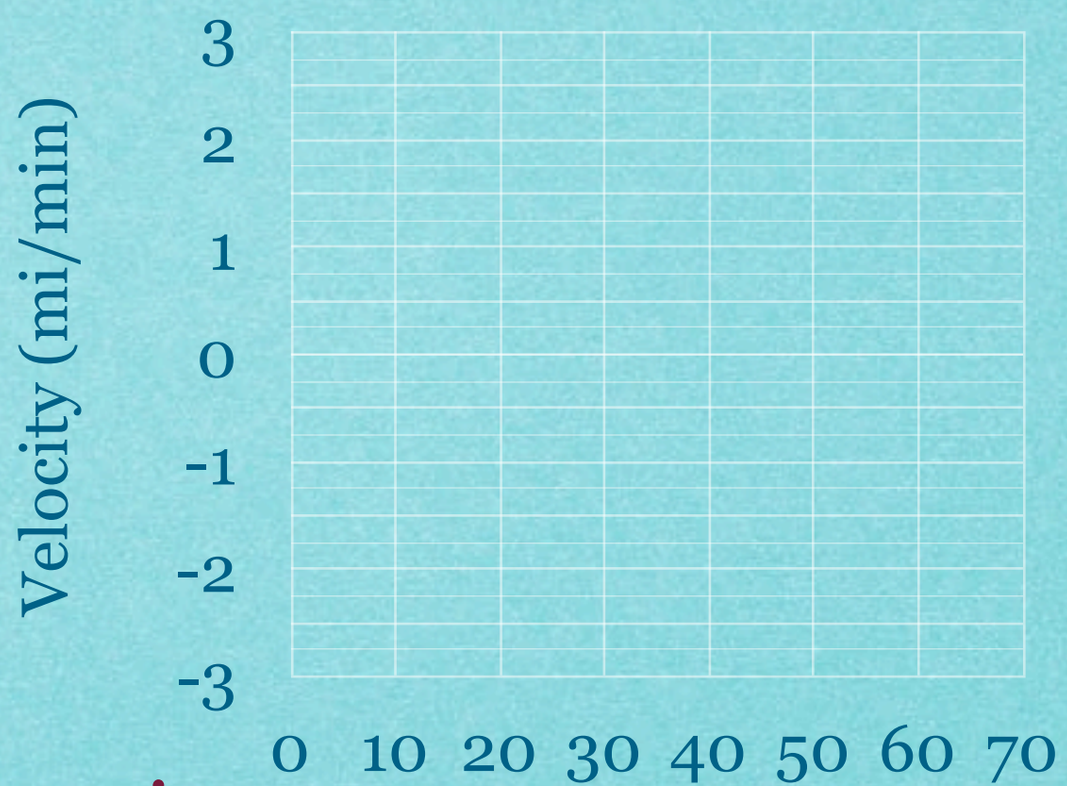


Now you try one on your own!



How'd you do?!





Step 1: Break graph into sections

Step 2: Find the slope of the line in each section

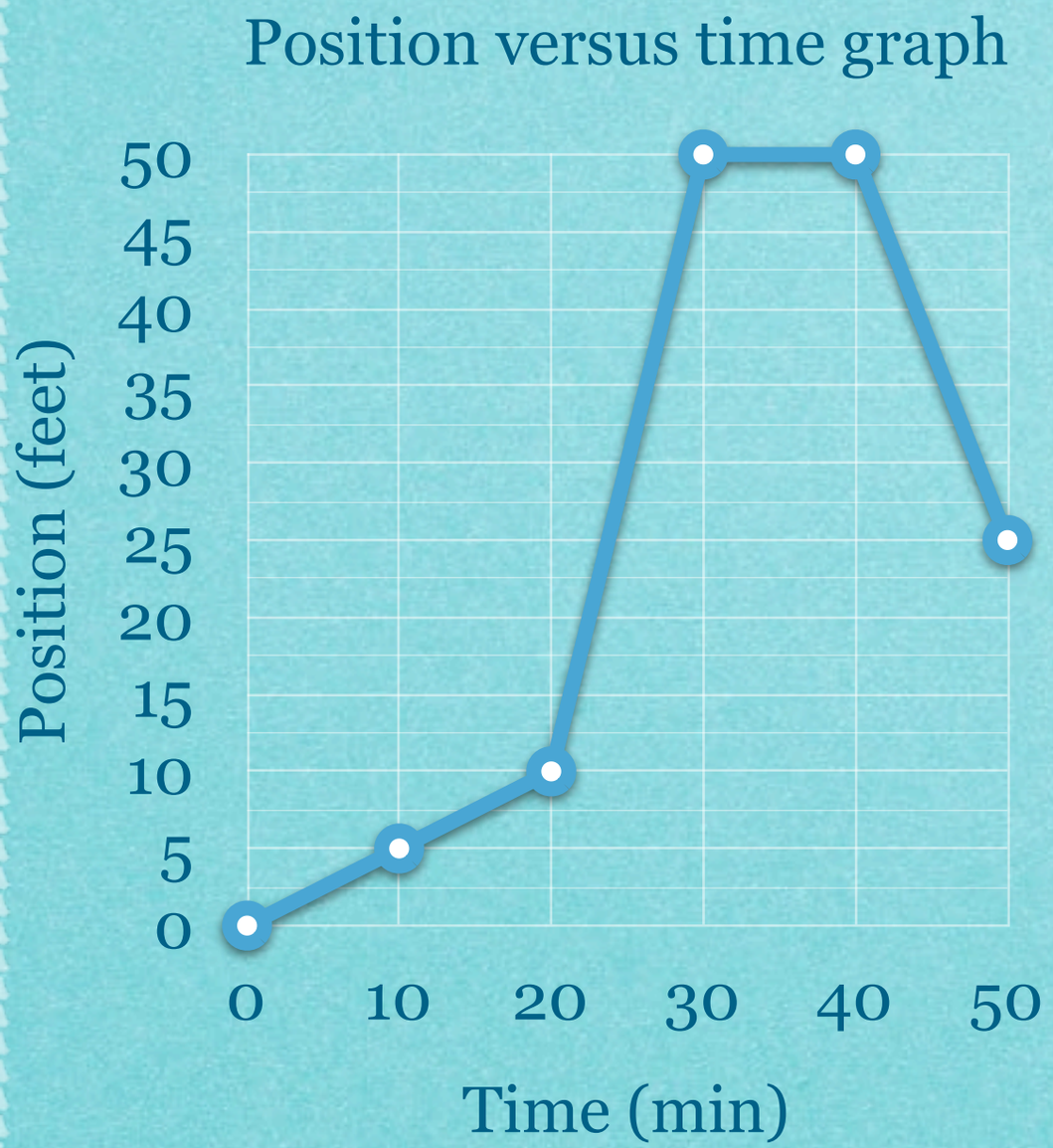
Step 3: Graph on the velocity versus time graph

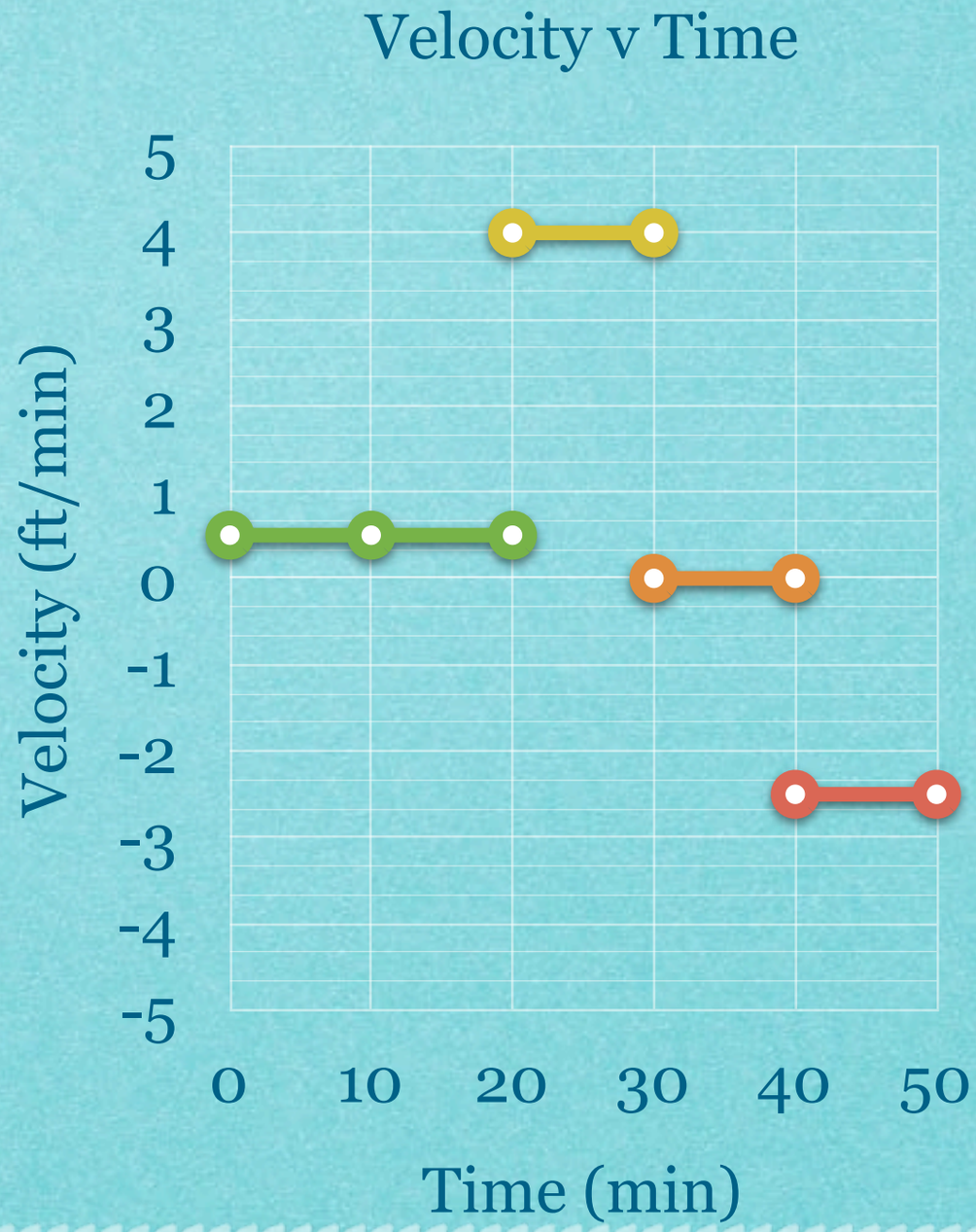
Another relative speed ?

- You and your dog are on a walk, both with a speed of 2 m/s. A runner passes by you going the opposite direction with a speed of 5 m/s.

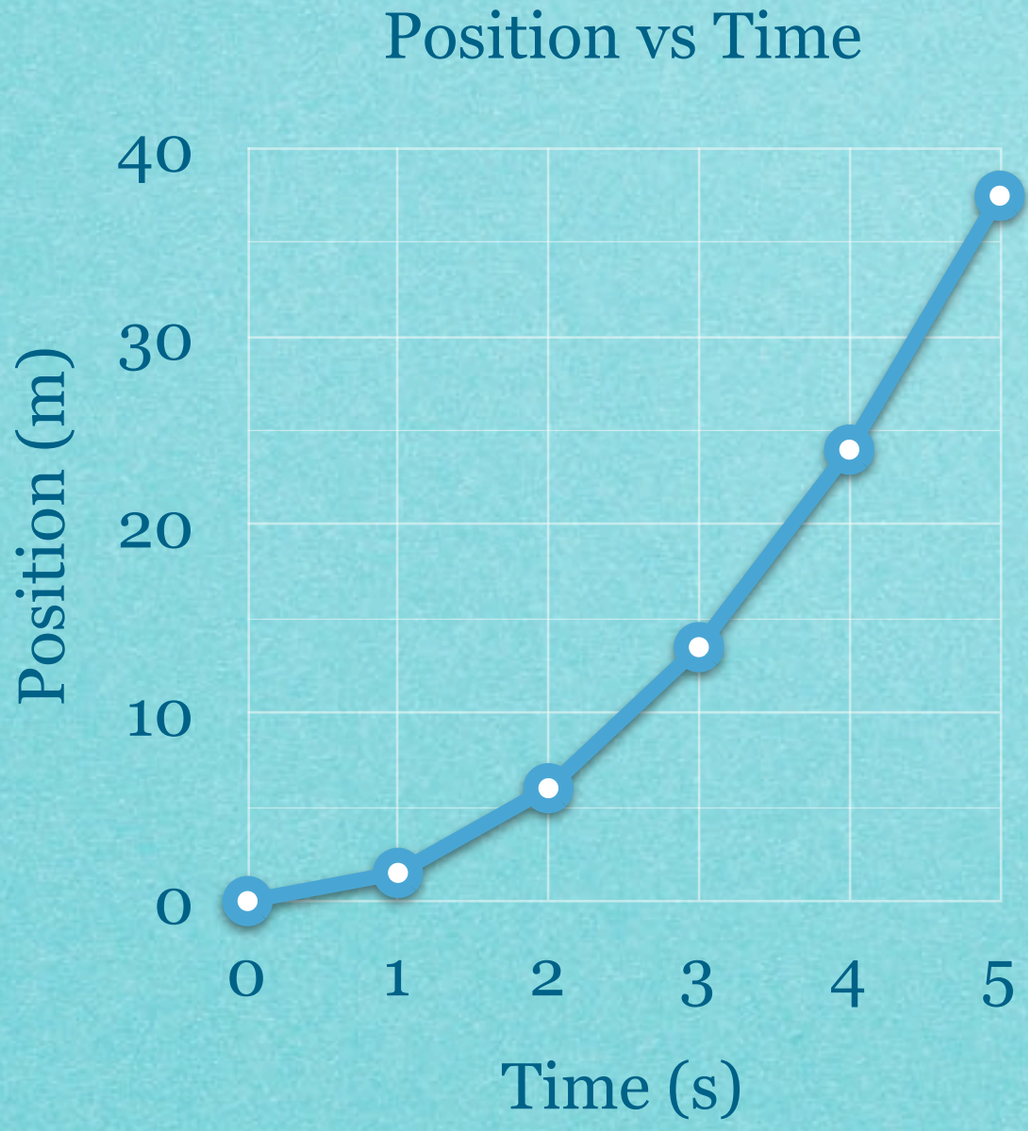
- What is your speed relative to the runner?
- relative speed = 2 m/s + 5 m/s = 7 m/s
- What is your speed relative to the dog?
- Relative speed = 2 m/s - 2 m/s = 0 m/s

Create a v vs t from a x vs t



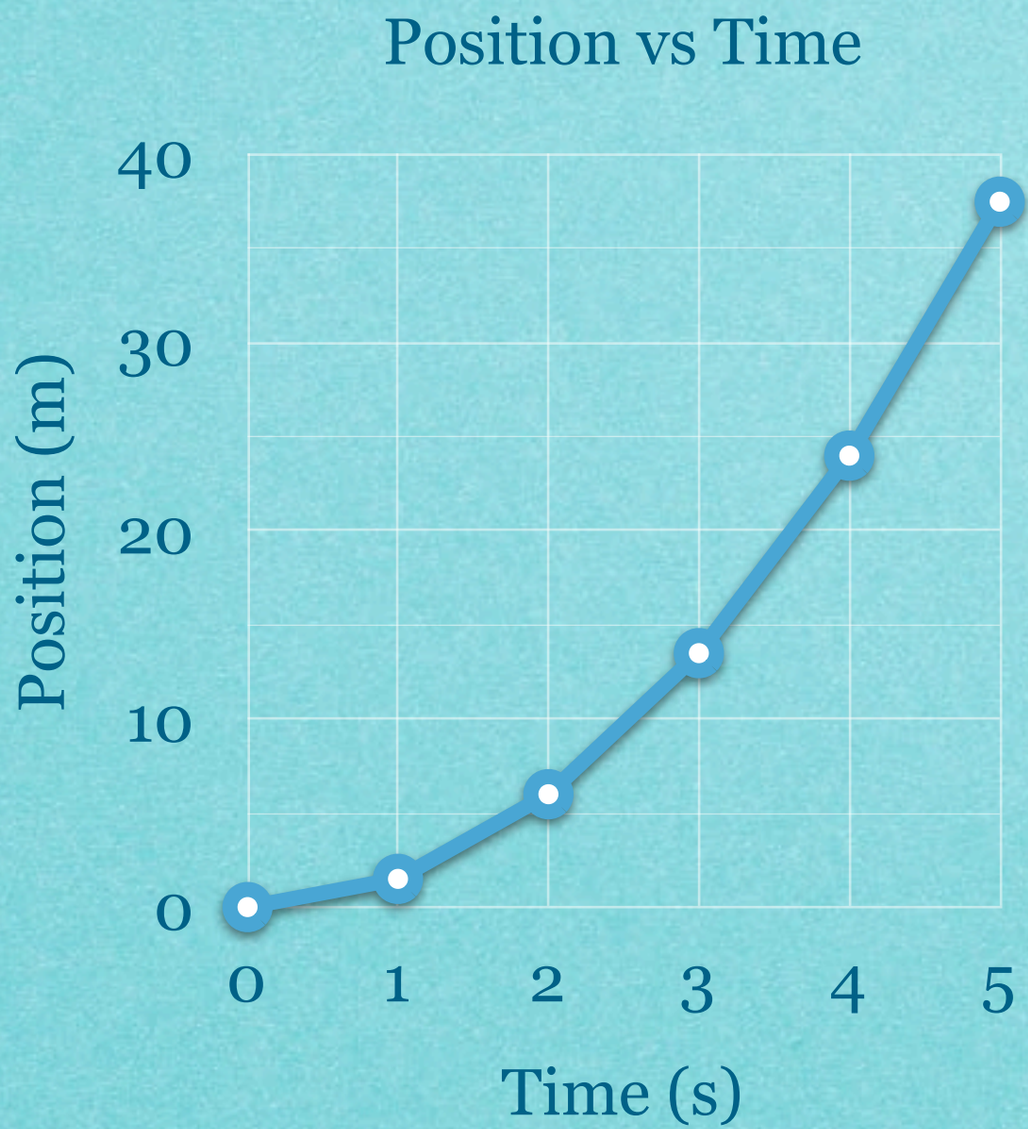


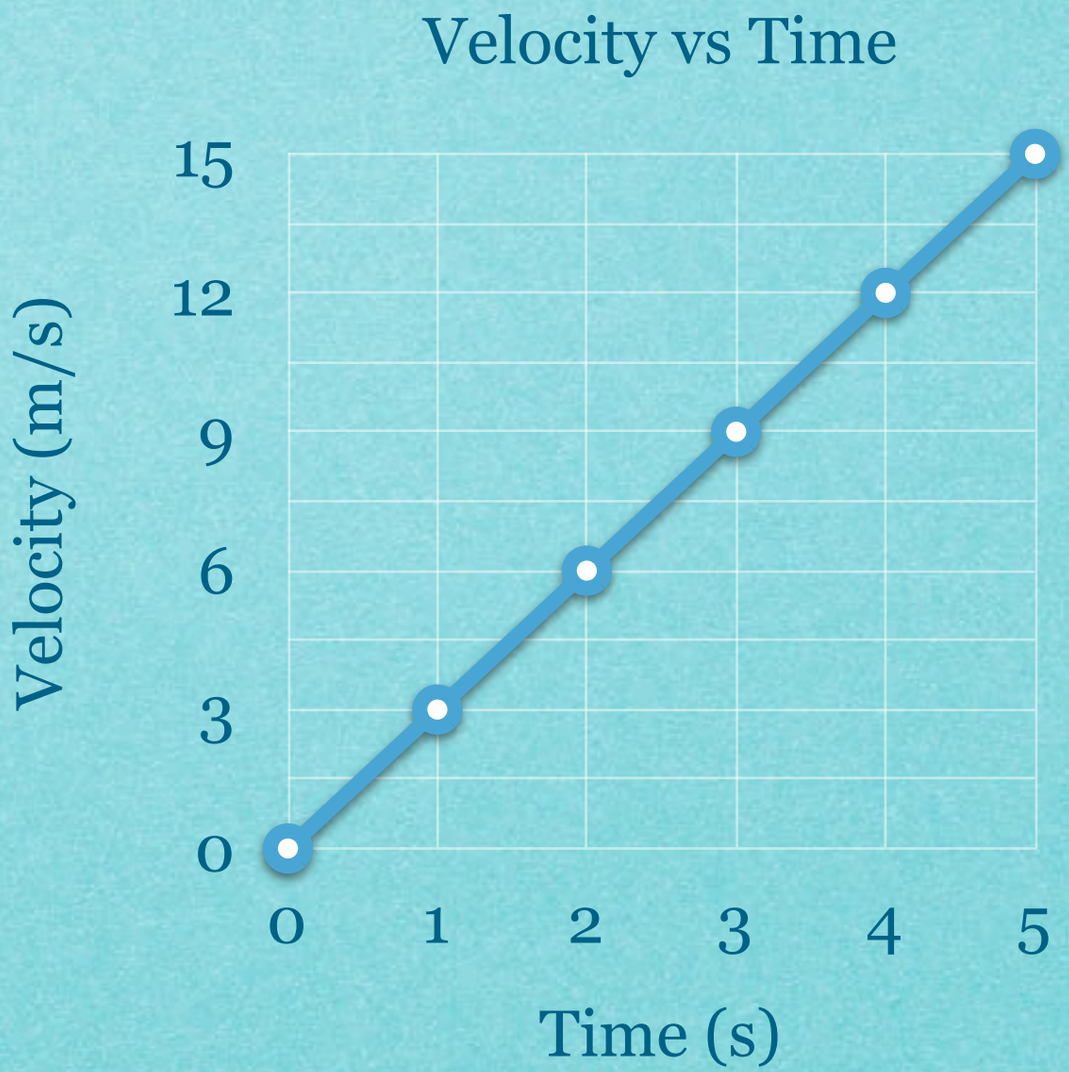
What if... the object was not moving at a constant velocity?



- Could you draw a velocity versus time graph for a velocity that was changing?
- yes

Yes! If the objects velocity is changing at a constant rate, then the velocity versus time graph would look like this:





Acceleration

What is it?

is a vector quantity that is defined as the rate at which an object changes its velocity. An object is accelerating if it is changing its velocity.

acceleration = change in velocity / time

- $a = (v_f - v_i) / t$ also written $a = \triangle v/t$
- Unit of acceleration (a) = m/s^2
- Unit of velocity (v) = m/s
- Unit of time = s
- How do we get m/s^2 from m/s / s
- Take m/s ÷ s/1 , flip our second fraction and multiply across..... so we have m/s × 1/s and multiply across.... we end up with m/s^2

Ways velocity can change:

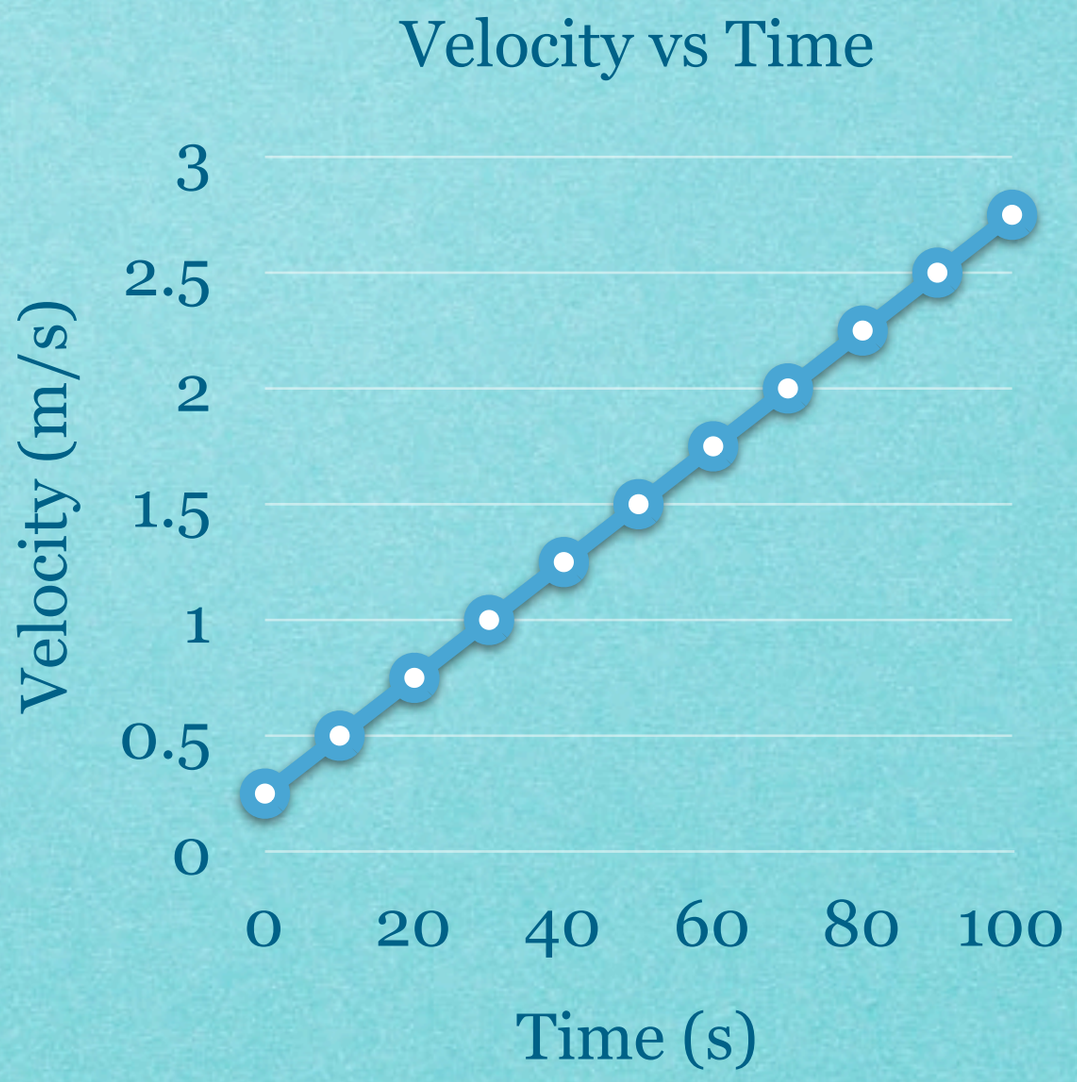
- Change in speed (speeding up or slowing down)
- Changing direction
- Or both!

It is a vector quantity

- Acceleration can be POSITIVE or NEGATIVE
- Positive acceleration - speeding up - velocity and acceleration are in the same direction
- Negative acceleration - slowing down - velocity and acceleration are in opposite directions

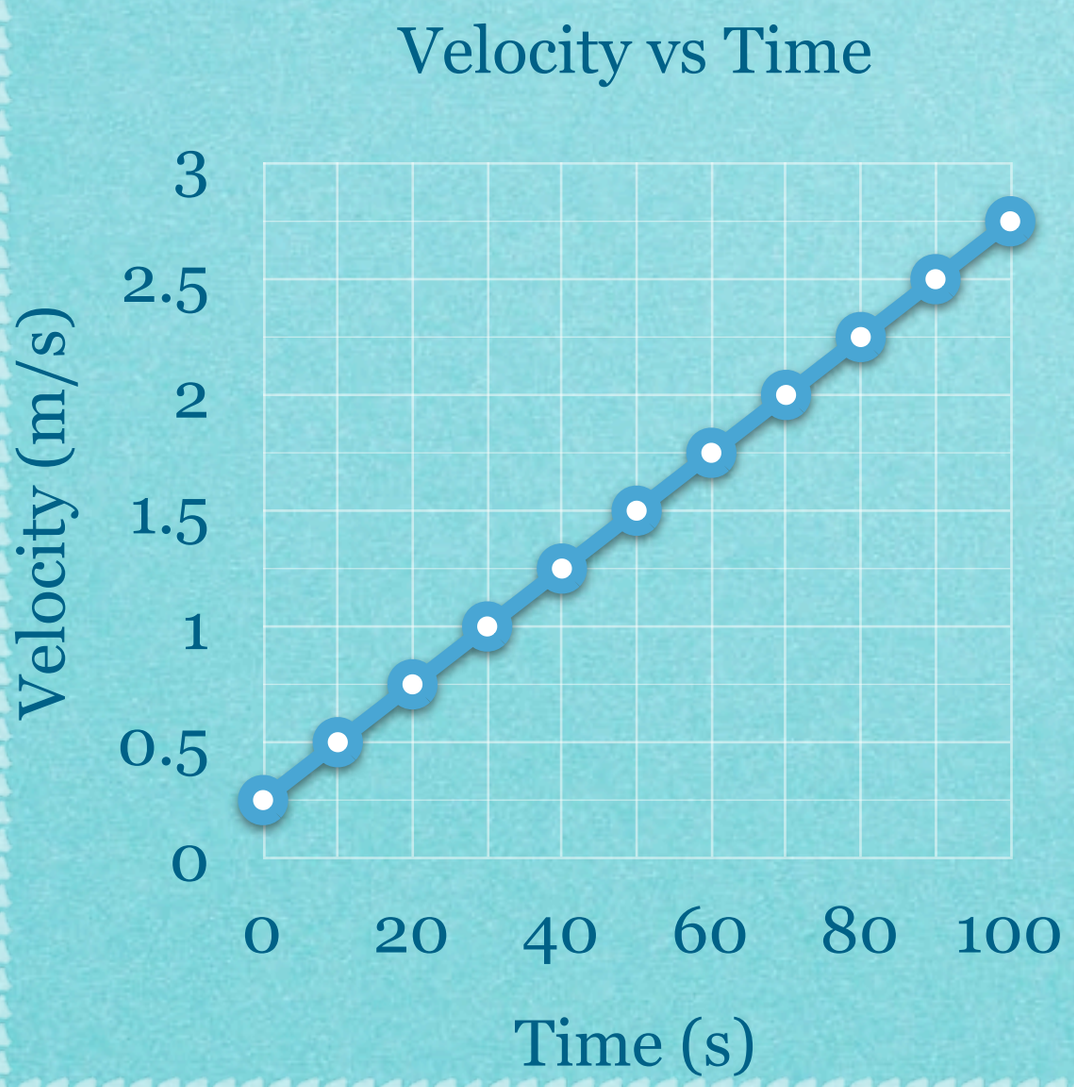
Back to the velocity versus time graph....

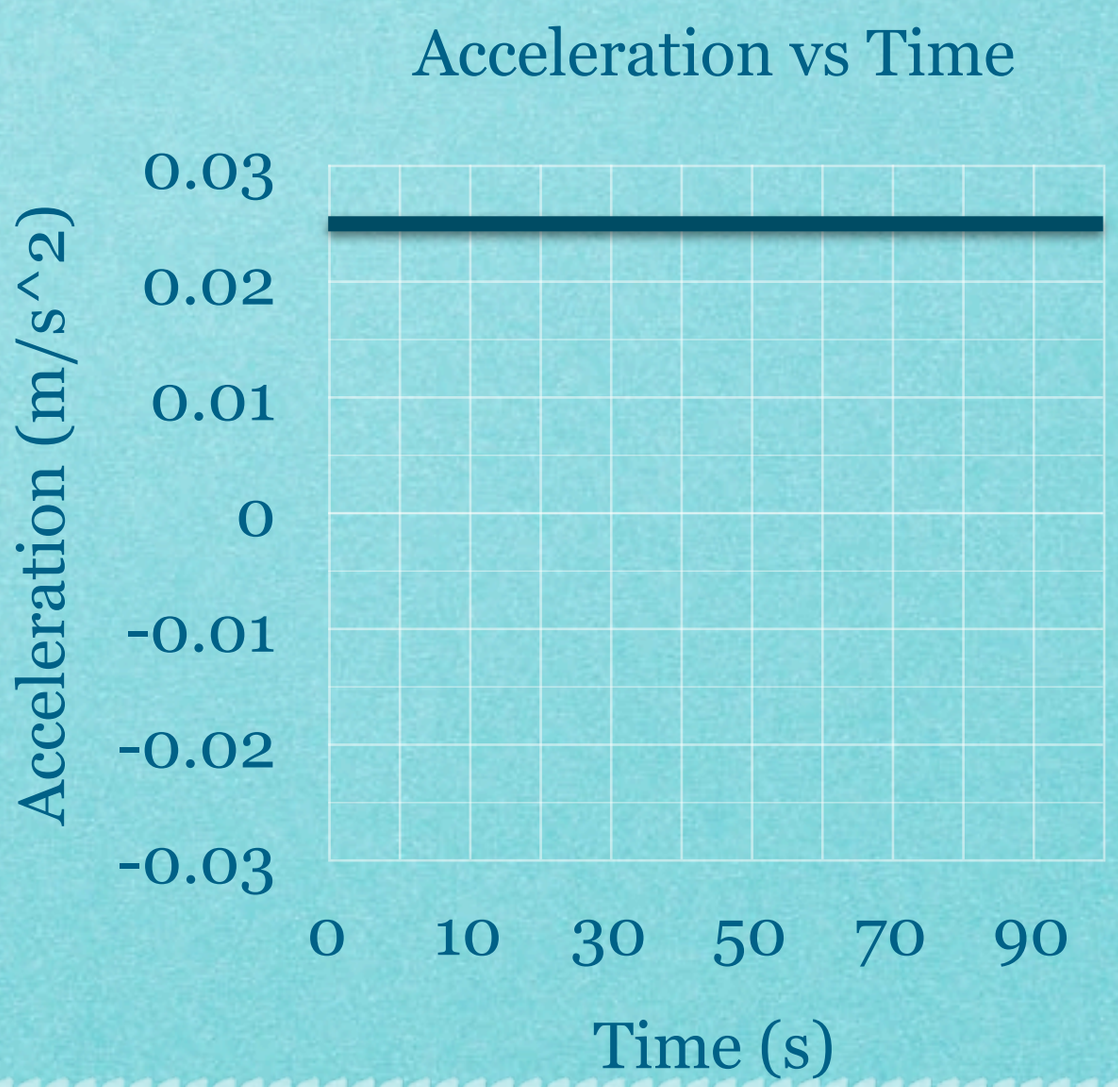
- What does the diagonal line tell us about the velocity?
- IT IS INCREASING
- The object is....
- ACCELERATING



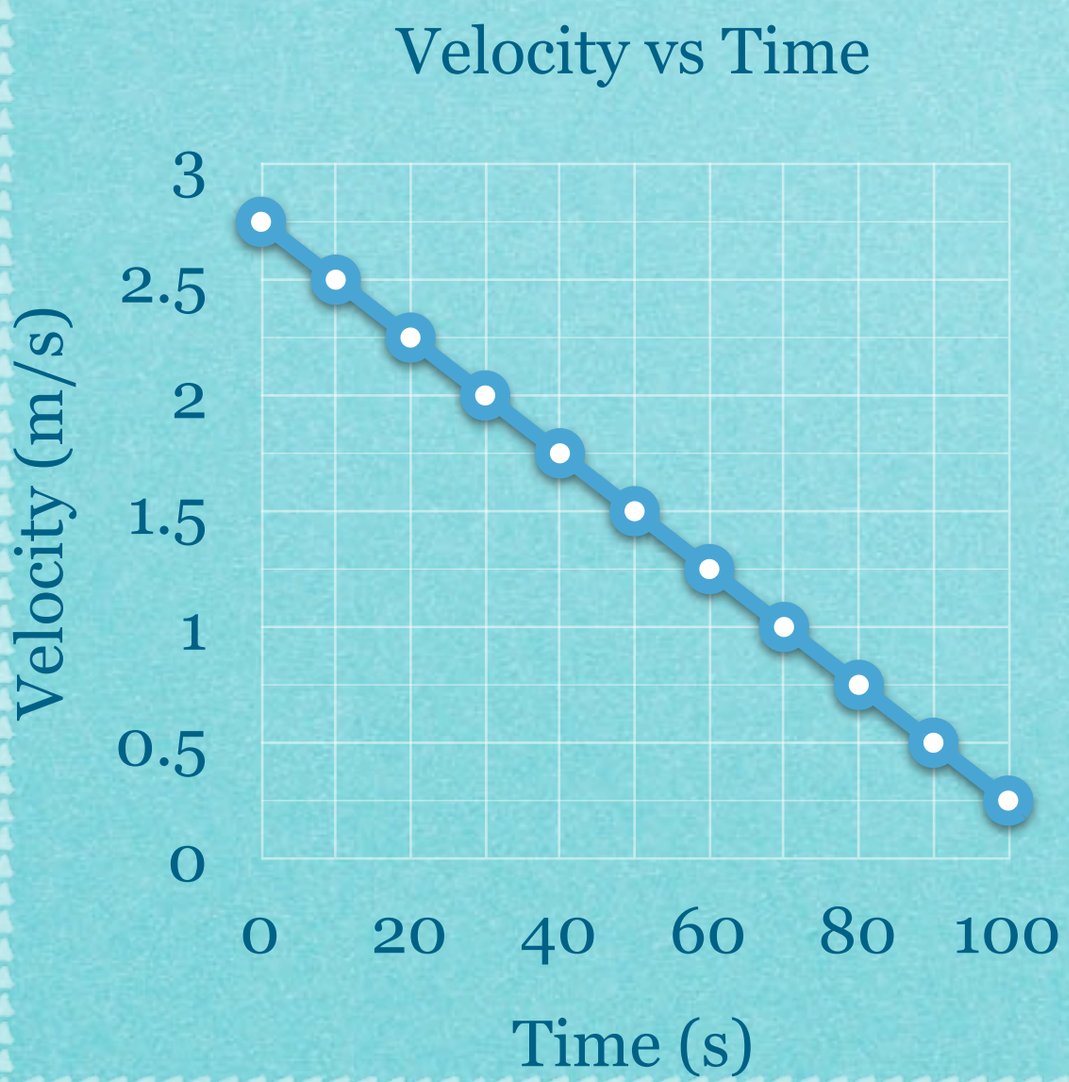
That means we have an acceleration!!!!

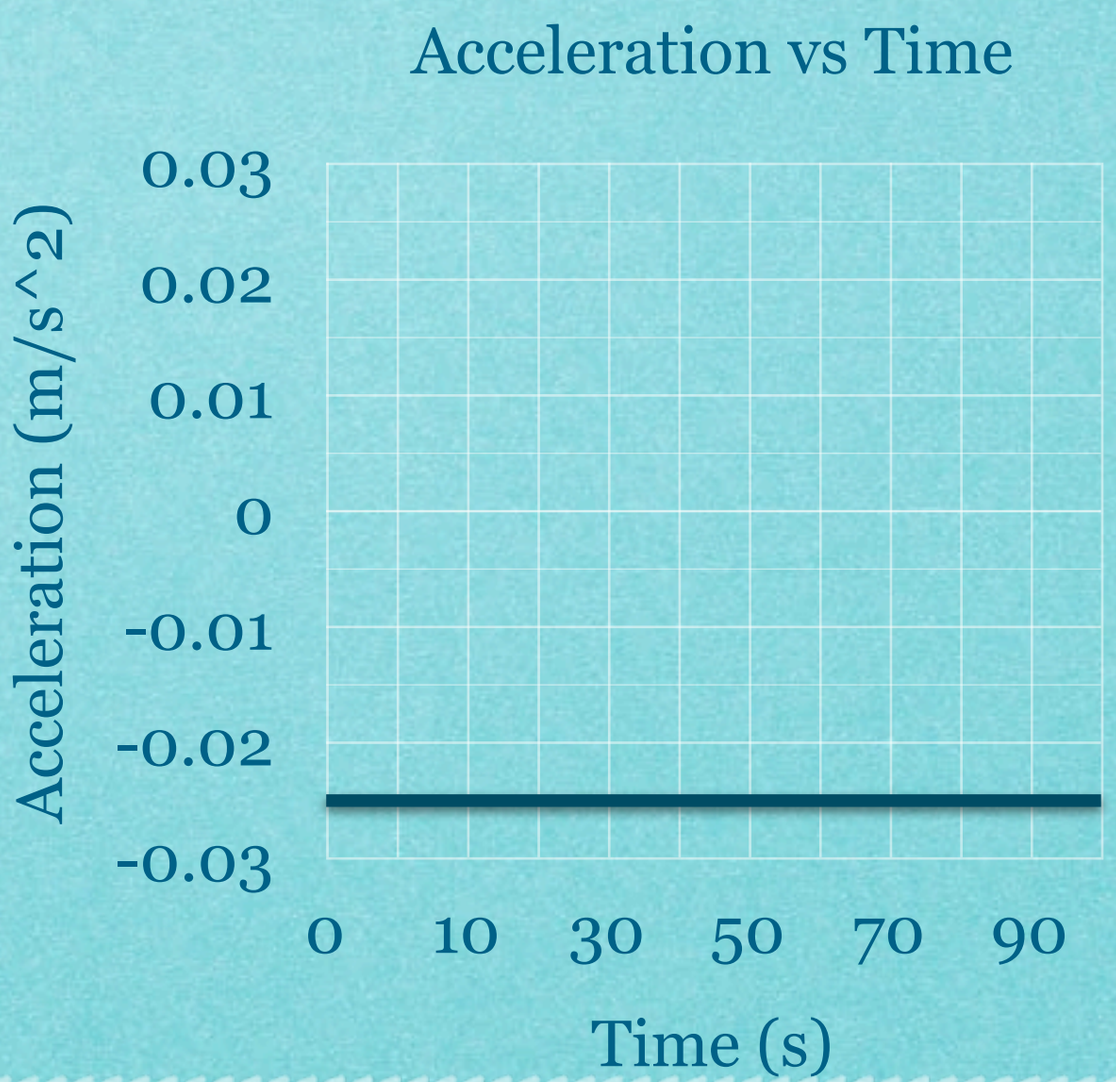
- Is it a constant acceleration??? Lets graph it!



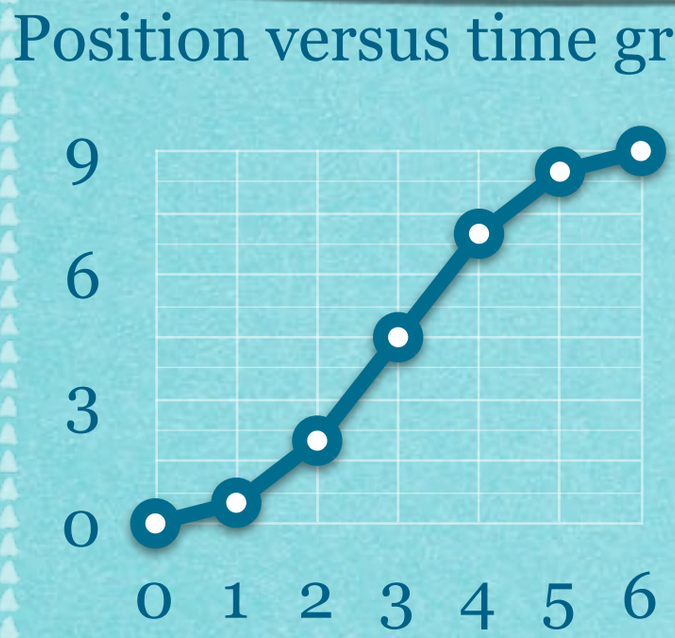


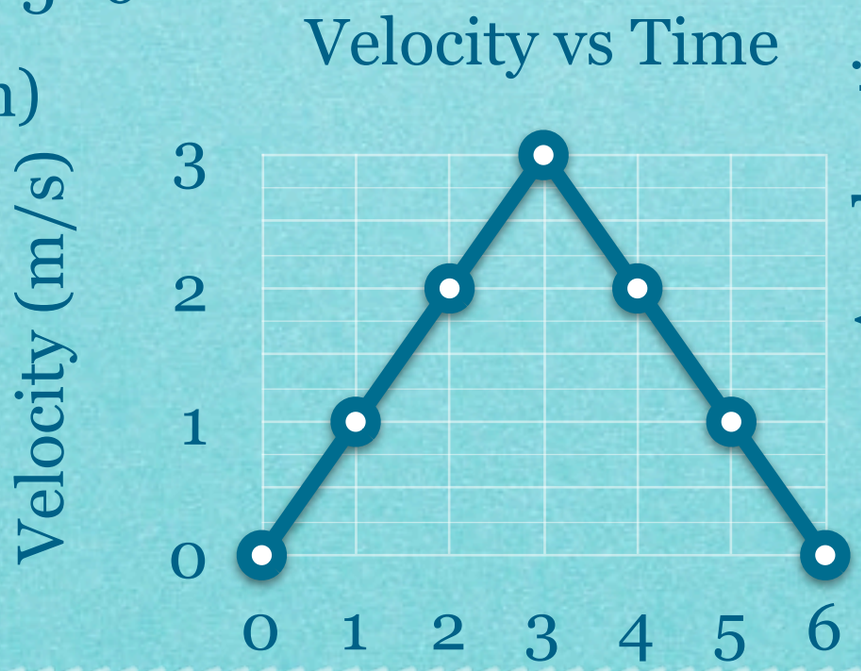
What if we have a constant negative velocity?

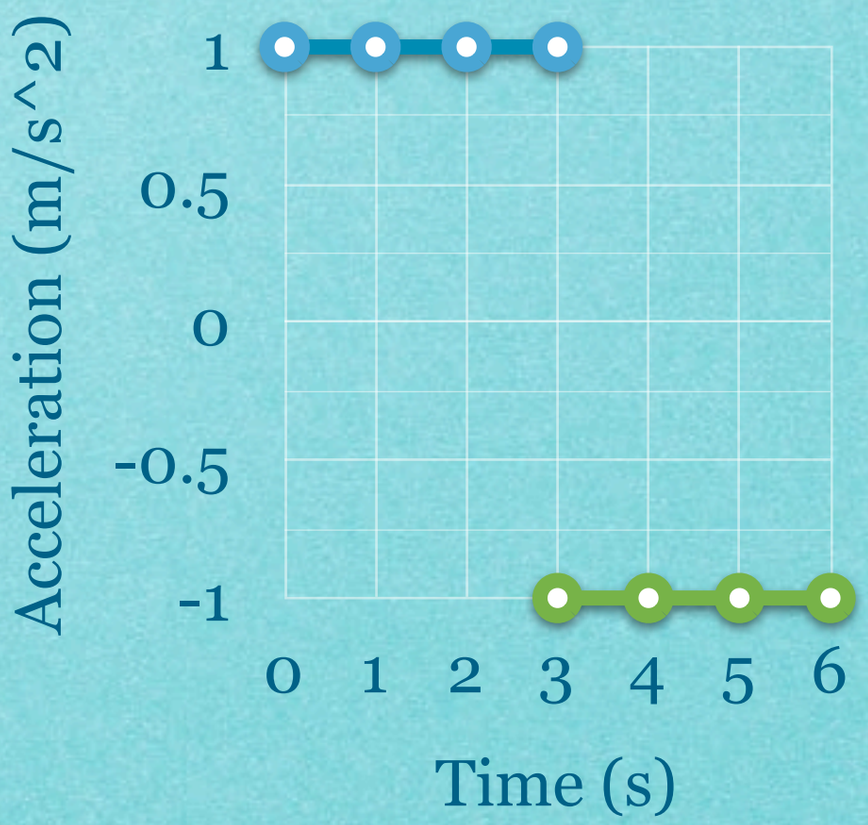




What if there was a direction change on v vs t graph....







Graphing Review...

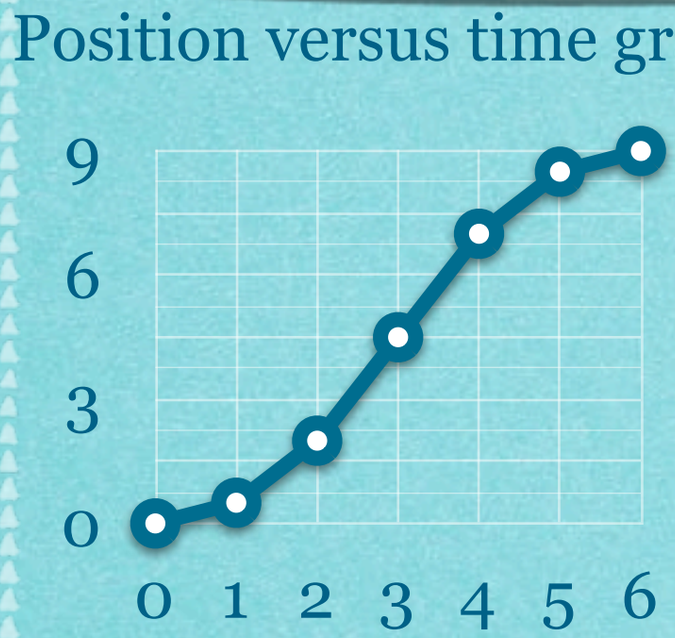
- Try this on your own.... I want to know what you know and if you can take what you know about position time graphs and the new information you have learned about velocity versus time / acceleration versus time graphs and apply it!!

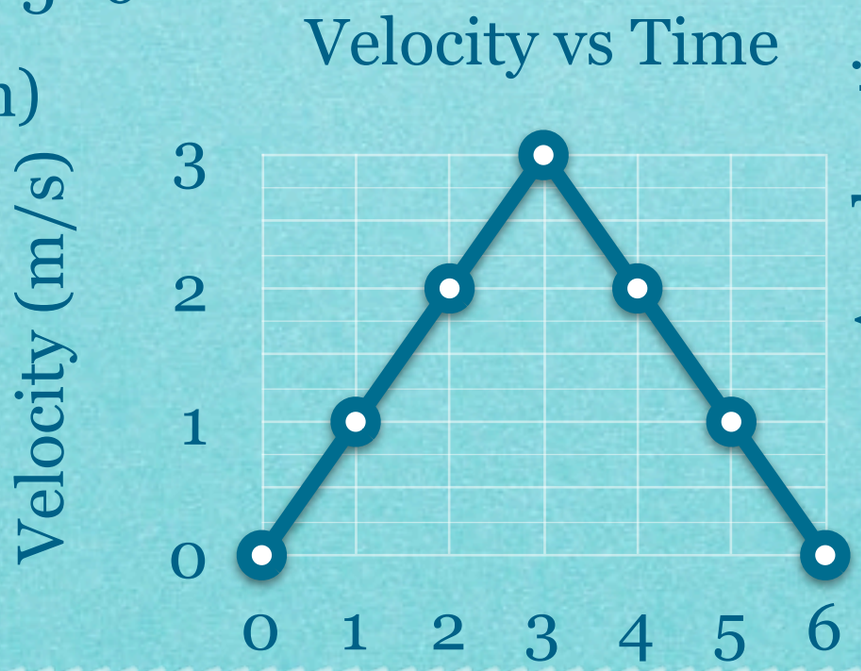
HOMEWORK!!!!

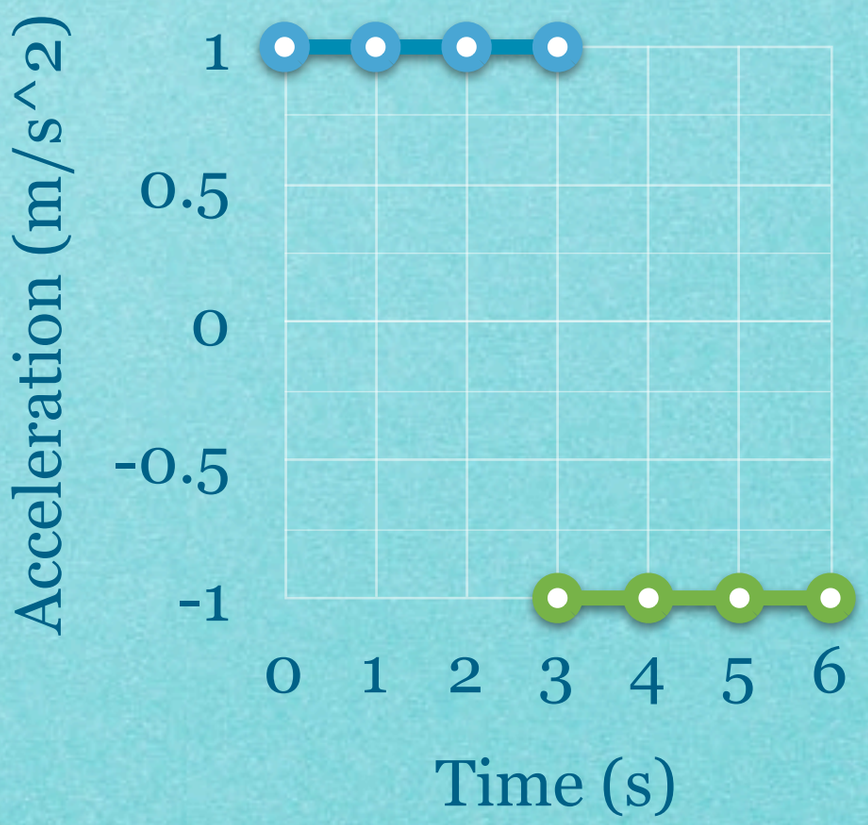
- If you do not finish, this is your homework!! PLEASE PLEASE PLEASE.... USE YOUR NOTES TO HELP GUIDE YOU!

- Ask for help if you feel lost!

What if there was a direction change on v vs t graph....







relative speed practice

- The ice cream truck is driving through your neighborhood due west with a speed of 30 mph. The neighbor girl is running down the street due east to catch it. She is running with a speed of 6 mph.
- What is the little girls speed relative to the ice cream truck?
- What is the ice cream trucks speed relative to you, a stationary bystander?

- $a = (v_f - v_i) / t$

- A car beginning at rest is moving at 50 m/s after 10 s. What is the car's acceleration

- $a = (v_f - v_i) / t$

- A roller coaster started at rest is moving at 60 m/s after 20 s. What is the roller

coaster's acceleration?

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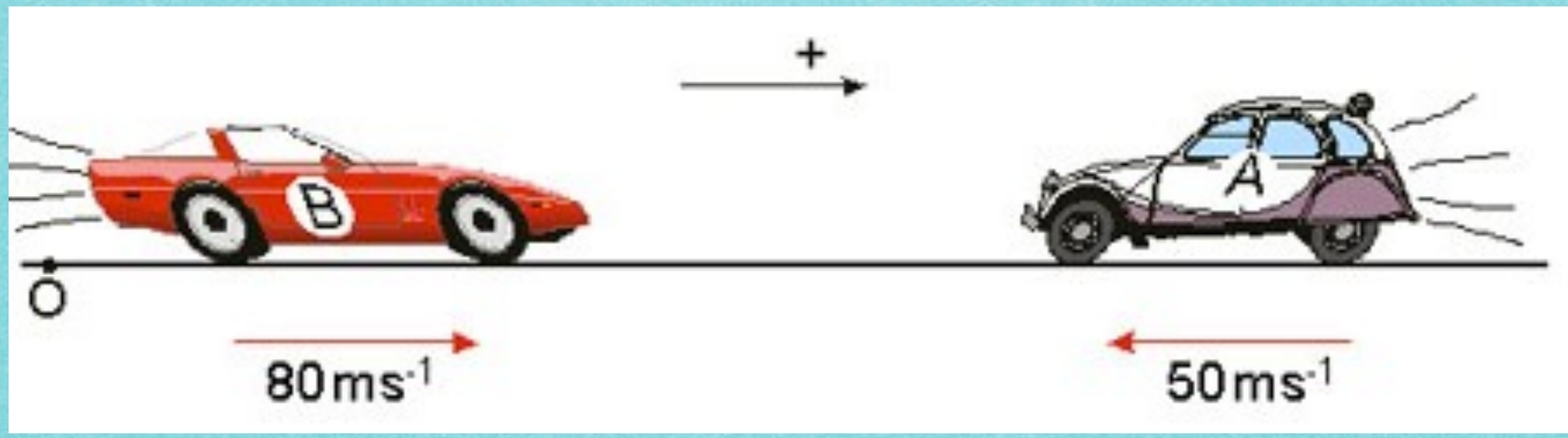

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